Ada Lace and Ham Radio Exploration Chapter 1

Objectives:

Students will:

- Learn about ham radios and their historical and modern uses.
- Explore the character Ada Lace and her engineering skills.
- Understand basic electronics and circuits through hands-on activities.
- Practice phonetic alphabet and call signs used in ham radio communication.

Suggested Grade Levels:

3rd-8th Grade

Subject Areas:

- Science (Earth & Space, Physics, Engineering)
- Technology
- Reading and Literacy
- History

Time Allotment:

2-3 class periods (45-60 minutes each)

Next Generation Science Standards:

- **3-PS2-4:** Define a simple design problem that can be solved by applying scientific ideas about magnets (connection to radio waves and antennas).
- **4-PS3-4:** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another (electronic circuits).
- **5-PS1-3:** Make observations and measurements to identify materials based on their properties (circuit components and conductivity).
- **MS-PS4-3:** Integrate qualitative scientific and technical information to support the claim that digitized signals are a reliable way to encode and transmit information.
- **MS-ETS1-1:** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.

Background Information:

- Overview of ham radio and its relevance in emergency communication and space exploration.
- Introduction to Emily Calandrelli, author of Ada Lace, Take Me to Your Leader.
- Overview of amateur radio licensing and call signs.
- Importance of antennas and signal strength in radio communication.
- Suggested resources:

- Amateur Radio Basics
- Emily Calandrelli's Website
- ARRL Introduction to Ham Radio

Vocabulary:

- **Ham Radio** – A two-way radio communication system used by licensed operators.
- **Antenna** – A device that sends and receives radio waves.
- **Circuit Board** – A board with electrical circuits that help operate electronic devices.
- **Call Sign** – A unique identifier for a ham radio operator.
- **Fine-tune** – To make small adjustments for better performance.

Materials:

- Copies of Ada Lace, Take Me to Your Leader (1 per pupil or projection device)
- Ada Lace, Take Me to Your Leader Part 1 of 3 (0:00-8:07)
- A ham radio (if available)
- Circuit-building materials as listed in optional activities below
- Printed phonetic alphabet charts
- Materials for call sign activity (see below)

Lesson Procedures:

1. **Before Reading Discussion:**
   - Ask students if they have read an Ada Lace book before.
   - Discuss ham radio: What is it? Have they seen one? Do they know someone who uses it?
   - Introduce Emily Calandrelli and her work.
   - If possible, visit a local antenna or station.
   - Watch a short video on ham radio use. "What is Ham Radio?" (YouTube)
2. **Reading Chapter 1:**
   - Who is the main character of the book? (Ada)
   - Who is George? (robot)
   - Why did he think that there was a fire? (Ms. Lace burned the toast.)
   - What did Ada throw her raincoat over, and why? (radio, to keep it safe/dry)
   - Explain the concept of "fine-tune" as seen on page 3. (revise to make improvements)
   - When Ada engineered George, what was his purpose? (keep her room safe)
   - Name the friend that Ada walks to school with. (Nina)
   - Where did Ada get the ham radio? (Mr. Peebles)
   - How does Nina know about these radios? (a book she is reading)
   - Why does Dad say they are called ham radios? (order a ham sandwich)
   - Explain another theory about where the word HAM comes from. (Hertz, Armstrong, Marconi)
   - Develop an alternative explanation of your own for the name HAM radio.
   - What is a circuit board, and why does Nina think it is pretty? (wire connections, colorful)
   - How might Ada test to see if the circuit was damaged by moisture?
   - Define "call sign" (special radio name) and find Ada's call sign (KD8PKR)
   - How does a person get a call sign? (license, take a test)
   - What do the girls hear on the radio? (static)

- Where does Ada think the antenna needs to go? (higher up, roof)
- Who helped put the antenna on the roof? (dad)

3. **Hands-on Activities:**
   - **Build a Simple Circuit**: Students create a basic flashlight circuit.
     i. ELECTRICITY for kids ⚡ Episode 3 💡 Create a Circuit 🔌 Conductive Materials an...
     ii. Simple Circuits - Structures of Science for Kids!
     iii. The Power of Circuits! | Technology for Kids | SciShow Kids
   - **Phonetic Alphabet Exercise**: Students spell their names using the phonetic alphabet.
     i. Phonetic Alphabet | GLR-MI-135
   - **Call Sign Activity**: Students create imitation call signs and practice ham radio conversations.
     i. Call Sign Activity Sheet

Differentiated Instruction:

a. **Visual Learners:** Videos, diagrams of circuits, and a real ham radio demonstration.
b. **Auditory Learners:** Listening to ham radio conversations and phonetic alphabet practice.
c. **Kinesthetic Learners:** Hands-on circuit building and role-playing call sign conversations.
d. **ESL Students:** Provide vocabulary lists with translations, use visuals, and practice phonetics.
e. **At-risk Students:** Assign peer partners, and provide structured guidance for activities.
f. **Advanced Learners:** Research different types of antennas and their effectiveness.

Extensions:

- Invite a local ham radio operator to demonstrate real-time communication.
- Research historical events where ham radio played a key role (e.g., Apollo 13, emergency response).
- Students track the International Space Station and listen for radio signals (NASA Live Stream).

Attachments:

- Circuit Building Worksheet